

CLAIMS

What is claimed is:

1. A tool (12) for breaking hard material, comprising:
 - a body (14) having an opening (16) therethrough forming a barrel (18), which receives a spring assembly (24) therein, the barrel (18) having a threaded opening (28) at a first end (20) of the barrel (18) and a fitted opening (30) at a second end (22) of the barrel (18);
 - an actuator pin tube (26) having a first and a second end (32 and 34), and an opening (36) therethrough for slidably engaging an actuator pin (38), wherein the first end (32) of the actuator pin tube (26) is engaged securely in the fitted opening (30), and the second end (34) of the actuator pin tube (26) extends from the fitted opening (30);
 - the actuator pin (38) having a tip (40) and a retention head (42) at opposing ends (41 and 43) of the actuator pin (38), wherein the retention head (42) is wider than the opening (36) in the actuator pin tube (26), and the actuator pin (38) is longer than the actuator pin tube (26) permitting the tip (40) to extend through the second end (34) of the actuator pin tube (26);
 - the spring assembly (24) comprises a hammer guide (44) engaged in the threaded opening (16), a hammer (46) slidably engaged through the hammer guide (44), a handle mechanism (55) for manually cocking the hammer (53) disposed on a first end of the hammer (46), a spring retainer (52) disposed adjacent a second end (50) of the hammer (46), and a spring (54) engaged on the hammer (46) between the spring retainer (52) and the hammer guide (44), wherein the second end (50) of the hammer (46) is formed into a hammerhead (51), and the hammerhead (51) is extended towards the retention head (42) when the spring (54) is fully relaxed; and
 - a release mechanism (56) for releasably engaging the hammer (46).
2. The tool of claim 1 further comprising:
 - a safety mechanism (89) for preventing premature release of the hammer (46) when the hammer (46) is engaged in the release mechanism (56).

3. The tool of claim 1, further comprising:
a sighting mechanism (81) for visually determining whether the actuator pin (38) is properly positioned.
4. The tool of claim 1, wherein:
the release mechanism (56) comprises a release plate (58) slidably engaged on the body (14) adjacent the first end (20) of the barrel (18) and having the hammer (46) slidably engaged in an elongated opening (60) of the release plate (58) wherein the elongated opening (60) has a wide portion (62) and a narrow portion (64), and the hammer (46) has a retention groove (66) disposed between the first and second ends (48 and 50) of the hammer (46) such that the hammer (46) can freely slide when the wide portion (62) is engaged on the hammer (46) but is retained in position when the retention groove (66) is engaged in the narrow portion (64) of the elongated opening (60), and a release opening (93) for receiving a pull cord (94) is disposed in the release plate adjacent the wide portion (62) and opposite the narrow portion (64) such that force applied to the pull cord (94) pulls the release plate (58) to release the hammer (46).
5. The tool of claim 4, wherein:
the release plate (58) is slidably engaged on first and second release plate screws (68 and 70) each having a collar (69) and a threaded portion (67) wherein the release plate screws (68 and 70) and the body (14) are further separated by first and second washers (72 and 74) and the release plate screws (68 and 70) are fixedly engaged in threaded openings (76 and 78) of the tool body (14) wherein the threaded openings (76 and 78) of the tool body (14) are flanking the threaded opening (28) of the barrel (18).
6. The tool of claim 3, wherein:
the sighting mechanism (81) comprises a sight hole (80) in the body (14) and a visual indicator (82) disposed on the retention head (42) of the actuator pin (38), wherein the visual indicator (82) is visible through the sight hole (80)

when the actuator pin (38) is in proper position relative to a load cartridge (84).

7. The tool of claim 2 wherein:

the safety mechanism (89), when engaged, is disposed on the release mechanism (56).

8. The tool of claim 4, further comprising:

a safety mechanism (89), wherein the safety mechanism (89) is an extension (86) of the elongated opening (60) for slidably receiving a safety clip (88) therethrough.

9. The tool of claim 1, wherein:

the barrel (18) further comprises a pinched region (83) adjacent actuator pin tube (16) from sliding into the body (14).

10. The tool of claim 1, wherein:

the handle mechanism (55) for manually cocking the hammer (46) comprises a ring-handle (53) engaged in an opening (106) through the first end (48) of the hammer (46).

11. The tool of claim 1, further comprising:

anchor openings (79) disposed through the body (14), substantially perpendicular to the barrel (18), and adjacent to the fitted opening (30), for applying restraining forces therethrough preventing the tool's (12) dislodgement during-handle detonation of a load cartridge (84).

12. The tool of claim 8, wherein:

the safety clip (88) is attached to the handle mechanism (55) via a cord (90).

13. A kit comprising:

A tool (12) for breaking rock, a rubber bulb hole blower (112), a cord keeper (116) with a release cord (94) and a clip (92) disposed on the release

cord (94), a package (120) containing load cartridges (84), and an instruction manual (124);

wherein the tool (12) comprises a body (14) having an opening (16) therethrough forming a barrel (18), which receives a spring assembly (24) therein, the barrel (18) having a threaded opening (28) at a first end (20) of the barrel (18) and a fitted opening (30) at a second end (22) of the barrel (18);

an actuator pin tube (26) having a first and a second end (32 and 34), and an opening (36) therethrough for slidably engaging an actuator pin (38), wherein the first end (32) of the actuator pin tube (26) is engaged securely in the fitted opening (30), and the second end (34) of the actuator pin tube (26) extends from the fitted opening (30);

the actuator pin (38) having a tip (40) and a retention head (42) at opposing ends (41 and 43) of the actuator pin (38), wherein the retention head (42) is wider than the opening (36) in the actuator pin tube (26), and the actuator pin (38) is longer than the actuator pin tube (26) permitting the tip (40) to extend through the second end (34) of the actuator pin tube (26); the spring assembly (24) comprises a hammer guide (44) engaged in the threaded opening (16), a hammer (46) slidably engaged through the hammer guide (44), a handle mechanism (55) for manually cocking the hammer (53) disposed on a first end of the hammer (46), a spring retainer (52) disposed adjacent a second end (50) of the hammer (46), and a spring (54) engaged on the hammer (46) between the spring retainer (52) and the hammer guide (44), wherein the second end (50) of the hammer (46) is formed into a hammerhead (51), and the hammerhead (51) is extended towards the retention head (42) when the spring (54) is fully relaxed; and

a release mechanism (56) for releasably engaging the hammer (46).

14. The kit according to claim 13, wherein:
the release cord (94) is preferably at least 25 feet long.

15. The kit according to claim 13, further comprising:
two tapered drift pins (118), a hex key (114), and a borehole cleaning brush (122).

16. A method for breaking hard material, comprising the steps of:
- a. providing a tool (12) for breaking hard material, wherein the tool (12)
 - i. comprises a body (14) having an opening (16) therethrough forming a barrel (18), which receives a spring assembly (24) therein, the barrel (18) having a threaded opening (28) at a first end (20) of the barrel (18) and a fitted opening (30) at a second end (22) of the barrel (18);
 - ii. an actuator pin tube (26) having a first and a second end (32 and 34), and an opening (36) therethrough for slidably engaging an actuator pin (38), wherein the first end (32) of the actuator pin tube (26) is engaged securely in the fitted opening (30), and the second end (34) of the actuator pin tube (26) extends from the fitted opening (30);
 - iii. the actuator pin (38) having a tip (40) and a retention head (42) at opposing ends (41 and 43) of the actuator pin (38), wherein the retention head (42) is wider than the opening (36) in the actuator pin tube (26), and the actuator pin (38) is longer than the actuator pin tube (26) permitting the tip (40) to extend through the second end (34) of the actuator pin tube (26);
 - iv. the spring assembly (24) comprises a hammer guide (44) engaged in the threaded opening (16), a hammer (46) slidably engaged through the hammer guide (44), a handle mechanism (55) for manually cocking the hammer (53) disposed on a first end of the hammer (46), a spring retainer (52) disposed adjacent a second end (50) of the hammer (46), and a spring (54) engaged on the hammer (46) between the spring retainer (52) and the hammer guide (44), wherein the second end (50) of the hammer (46) is formed into a hammerhead (51), and the hammerhead (51) is

- extended towards the retention head (42) when the spring (54) is fully relaxed; and
- v. a release mechanism (56) for releasably engaging the hammer (46) by pulling a pull cord (94) engaged on the release mechanism (56);
- b. providing a cartridge (84) having a tubular shaped casing (96) with a closed bottom (100) at one end and a primer (102) at the opposing end and a load (98) interspersed therebetween the bottom (100) and the primer (102);
- c. drilling a borehole (B) in a hard material (R) wherein the borehole (B) will accommodate the full length of the actuator pin tube (26) which extends from the fitted opening (30) of the barrel (18);
- d. cleaning out the borehole;
- e. inserting the load cartridge (84) all the way into the borehole (B) so the primer (102) will come into contact with the tip (40) of the actuator pin (38) once the actuator pin tube (26) is engaged in the borehole (B);
- f. shaking the actuator pin (38) into position so that the tip (40) extends from the second end (34) of the actuator pin tube (26);
- g. inserting the actuator pin tube (26) into the borehole (B) such that the tip of the actuator pin (38) meets the primer (102) of the load cartridge (84);
- h. connecting the pull cord (96) to the handle mechanism (55);
- i. extending the pull cord (96) to its full length; and
- j. pulling the pull cord (96) to detonate the load cartridge (84).
17. The method according to claim 16, further comprising:
- a. engaging a safety mechanism (89) to prevent premature release of the hammer (46); and
- b. disengaging the safety mechanism (89).
18. The method according to claim 16, further comprising:

- a. anchoring the tool (12) to the hard material adjacent the borehole (B) to prevent the premature disengagement of the tool (12) from the borehole (B), wherein the tool (12) further comprises anchor openings (79) disposed through the body (14), substantially perpendicular to the barrel (18), and adjacent to the fitted opening (30), for applying restraining forces therethrough preventing the tool's (12) dislodgement during-handle detonation of a load cartridge (84).
19. The method according to claim 16, further comprising:
 - a. verifying that the actuator pin (38) is appropriately positioned relative to the hammerhead (51) and the primer (102) of the load cartridge (84), wherein the tool (12) further comprises a sighting mechanism (81) for visually determining whether the actuator pin (38) is properly positioned.
 20. The method according to claim 16, wherein:
 - a. the release mechanism (56) comprises a release plate (58) slidably engaged on the body (14) adjacent the first end (20) of the barrel (18) and having the hammer (46) slidably engaged in an elongated opening (60) of the release plate (58) wherein the elongated opening (60) has a wide portion (62) and a narrow portion (64), and the hammer (46) has a retention groove (66) disposed between the first and second ends (48 and 50) of the hammer (46) such that the hammer (46) can freely slide when the wide portion (62) is engaged on the hammer (46) but is retained in position when the retention groove (66) is engaged in the narrow portion (64) of the elongated opening (60), and a release opening (93) for receiving a pull cord (94) is disposed in the release plate adjacent the wide portion (62) and opposite the narrow portion (64) such that force applied to the pull cord (94) pulls the release plate (58) to release the hammer (46).